HYDROGEOLOGIC EVALUATION OF THE BASS LAKE RECHARGE WELL

Starke County, Indiana
June 1, 2005

Conducted by:
Indiana Department of Natural Resources, Division of Water
In Accordance with Recommendations
Specified in the
Bass Lake Diagnostic Study

Prepared for:
Bass Lake Property Owners Association
6177 South State Road 10
Knox, Indiana 46534

Hydrogeologic Evaluation of the Bass Lake Recharge Well

Introduction

The Bass Lake Diagnostic Study is a comprehensive examination of Bass Lake and its surrounding watershed that describes conditions and trends in the lake and the watershed, identifies potential problems, and makes prioritized recommendations addressing these problems. The study was initiated in 2001 by J.F. New & Associates, Inc. and Indiana University's Center for Geospatial Data Analysis. Funding for the study has been made available through the Indiana Department of Natural Resources Lake and River Enhancement Program.

The Bass Lake Diagnostic Study identifies the two greatest concerns of Bass Lake residents to be: 1) low lake levels, and; 2) the quality of water within the lake. In response to the issue of low lake levels, a large capacity well was installed in 1964 to provide additional recharge to the lake. The geologic evaluation that was included in the diagnostic study identifies an upper and lower aquifer at Bass Lake, and indicates that a potential hydrologic connection may exist between the two aquifers. If a hydrologic connection does exist, ground water withdrawn by the recharge well from the lower aquifer may be impacting the water level in the upper aquifer, which is believed to provide water to the lake. The diagnostic study recommended that a ground-water monitoring system be installed in the vicinity of the recharge well to evaluate the existence and connection between the two aquifers in order to determine the most cost effective pumping rate, and the well's ability to regulate the lake level. In response to this recommendation, the Division of Water has conducted a hydrogeologic evaluation of the Bass Lake recharge well. This evaluation further investigated the hydrogeology present in the vicinity of the well by utilizing pumping test information, ground water and lake level monitoring data, and water temperatures measured in the deep aquifer and in Bass Lake.

Background

Investigations of various methods to maintain higher water levels in Bass Lake are known to have been conducted as early as 1941, and studies completed in 1947 and 1956 evaluated the potential of installing high capacity well(s) to raise lake levels. In November of 1964, the Bass Lake Property Owners Association installed a well in order to provide additional recharge to the lake. The well was drilled to a depth of 110 feet, and was equipped with 80 feet of 16-inch diameter casing, and 28 feet of 12-inch diameter screen. The water well record (Appendix A) identifies fine gravel from a depth of 70 feet to 110 feet below land surface, and two clay layers at depths of 12 to 30 feet and 55 to 65 feet below land surface. At the time of installation, the well was test pumped for nine hours at a rate of 1,500 gallons-per-minute (gpm) with 29 feet of drawdown. The recharge well is currently equipped with a single-stage turbine pump having a total setting of 67 feet, and a pumping capacity of approximately 1400 gpm. Pumping from the

well into Bass Lake occurs primarily during the months of April through November. In accordance with Indiana's Water Management Act (IC 14-25-7), the Bass Lake Conservancy District has been reporting total annual water withdrawals from the well since 1989. Only estimated water use was reported to the Division of Water prior to the well being equipped with a flow meter in 2002. Total water use for 2003 and 2004 was reported to be 381.999 million gallons (MG) and 258.465 MG, respectively.

Pump Test Evaluation

On March 25 through 26, 2003, Division of Water staff, with the assistance of personnel from the Division of Soil Conservation, conducted a 24-hour pump test of the Bass Lake recharge well. The test was originally scheduled to begin on March 24; however, the well had previously been put into operation and was shut down for one day to allow ground-water levels to recover.

During the pump test, water level data was collected from seven domestic wells located in the vicinity of the recharge well, and from the recharge well itself. Wells at the Cambe, Pizur and Uzarowicz residences, and the pumping well, were regularly measured throughout the test while wells at the Revich, Spangelo, Sonnemaker and Swanson residences were periodically measured. A map showing the location of each well monitored during the pump test is shown in Figure 1.

A total of 1,981,000 gallons of water was discharged into the lake during the 24-hour test, representing an average pumping rate of approximately 1,375 gpm. The distance between each monitoring well and the pumping well, and the total amount of water level decline documented in each of the eight wells at the conclusion of the test, are as follows:

Well Name	Distance (ft.)	Total WL Decline (ft.)
Pumping Well	0	33.6
Uzarowicz	176.6	15.4
Pizur	302.2	14.4
Revich	302.5	14.5*
Cambe	454.1	13.4
Spangelo	532.4	8.8*
Swanson	681.5	8.3*
Sonnemaker	1563.3	5.5*

*total decline not exact due to periodic measurements

Hydrologic data collected during the test from the Cambe, Pizur, and Uzarowicz wells, and from the pumping well, were evaluated using the Jacob's Straight Line method of analysis. This method requires a constant pumping rate, and the plotting of drawdown (water level decline) in feet, measured in a monitoring well or the pumping well versus the time in minutes, since pumping began. The Jacob's Straight Line method provides an estimate of the Coefficient of Transmissivity, or "T" of an aquifer, which is an indicator

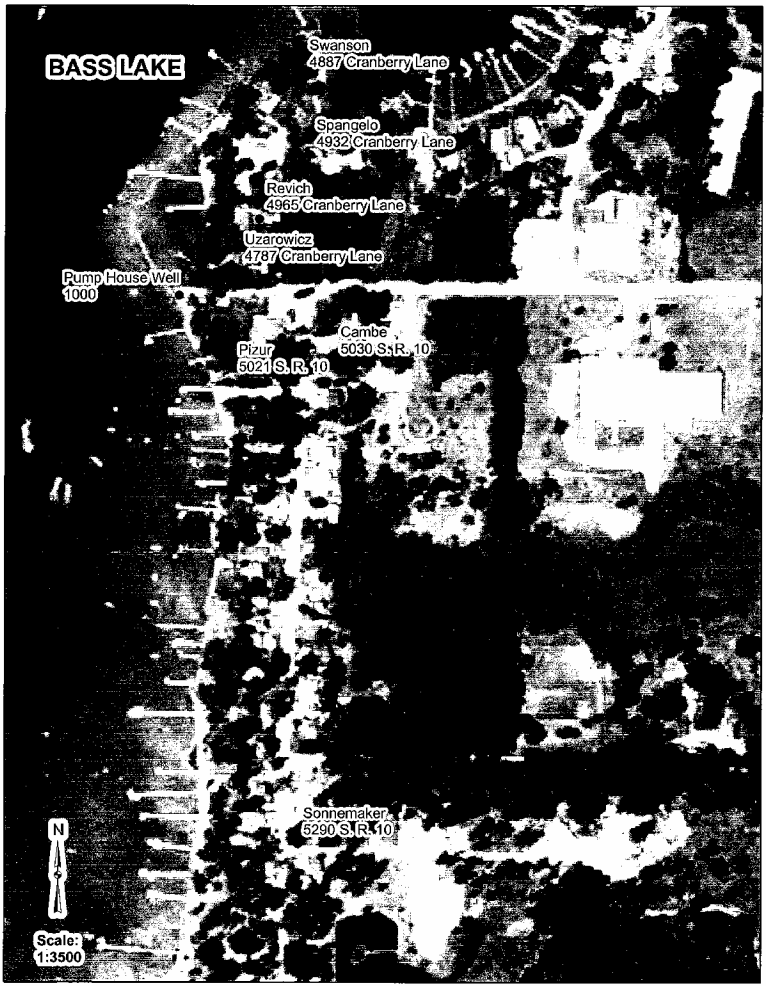


Fig. 1 - BASS LAKE PUMP TEST OBSERVATION WELL LOCATIONS

of its water-bearing capability. Transmissivity is defined as the rate at which water flows through a vertical strip of aquifer of unit width, and extending through the full saturated thickness under a unit hydraulic gradient. It is equivalent to the product of the saturated thickness and the hydraulic conductivity of an aquifer. Transmissivity values greater than 100,000 gallons-per-day (gpd) are representative of good aquifers for well exploitation (Freeze and Cherry, 1979). The Jacobs method also allows for the determination of the Storage Coefficient, or "S", which is defined as the volume of water which a unit volume of the aquifer releases from storage in a confined aquifer due to the expansion of water and compression of the aquifer under a unit decline in the average head within the volume of the aquifer. Storage Coefficients for confined aquifers range in value from 0.005 to 0.00005 (Freeze and Cherry, 1979). Time-drawdown plots of data collected from the Cambe, Pizur, and Uzarowicz wells, and the pumping well are shown in Figures 2 through 5, respectively. The following values of T and S were determined at each well site during the pump test:

Well Name	Transmissivity (T)	Coefficient of Storage (S)
Cambe	74,082 gal/day/ft.	0.00012
Pizur	74,082 gal/day/ft.	0.000186
Uzarowicz	75,625 gal/day/ft.	0.000354
Pumping well	95,526 gal/day/ft.	n/a

An average T value of 79,829 gal/day/ft. and S value of 0.00022 were calculated from the data, indicating the presence of a confined aquifer with fairly good water supply capability. In addition, ground-water levels appeared to be stable at the conclusion of the test, which provides some indication of the aquifer's ability to support the current pumping rate of the recharge well.

Ground Water Level Monitoring

Division of Water staff began periodic monitoring of ground water levels in the vicinity of the recharge well upon completion of the 24-hour pumping test. Water levels were measured in six domestic wells and in the pumping well at approximately one to two month intervals from May 7, 2003, until February 18, 2005. The water level data (measured in feet below top of well casing) are available in Appendix B. In addition to these periodic measurements, the well located at the Cambe residence was equipped with an In-Situ, Inc. Mini-Troll pressure transducer that provided daily water level readings. The transducer was installed on September 25, 2003, and collected data through November of 2004. Figure 6 displays water level fluctuations in the Cambe well during this time period, which includes the last few months of the Bass Lake recharge well's 2003 pumping cycle and the entire 2004 pumping cycle. A water level decline of approximately 15 feet was documented in the Cambe well during operation of the recharge well. The hydrograph shows no obvious lowering trend of the water level that might indicate that the withdrawals were exceeding the recharge capability of the aquifer. Figure 7 is a plot of water levels measured in the Sonnemaker and Revich wells during the period of May 7, 2003, through February 18, 2005. Data collected from these two

Fig. 2 - BASS LAKE PUMPING TEST (3/25 - 3/26/03)
CAMBE OBS. WELL

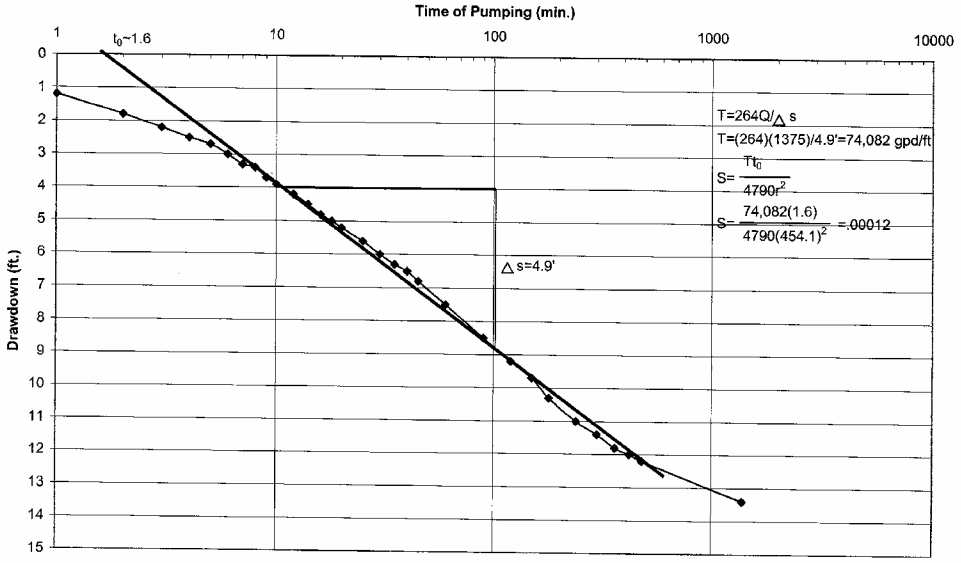


Fig. 3 - BASS LAKE PUMPING TEST (3/25 - 3/26/03)
PIZUR OBS. WELL

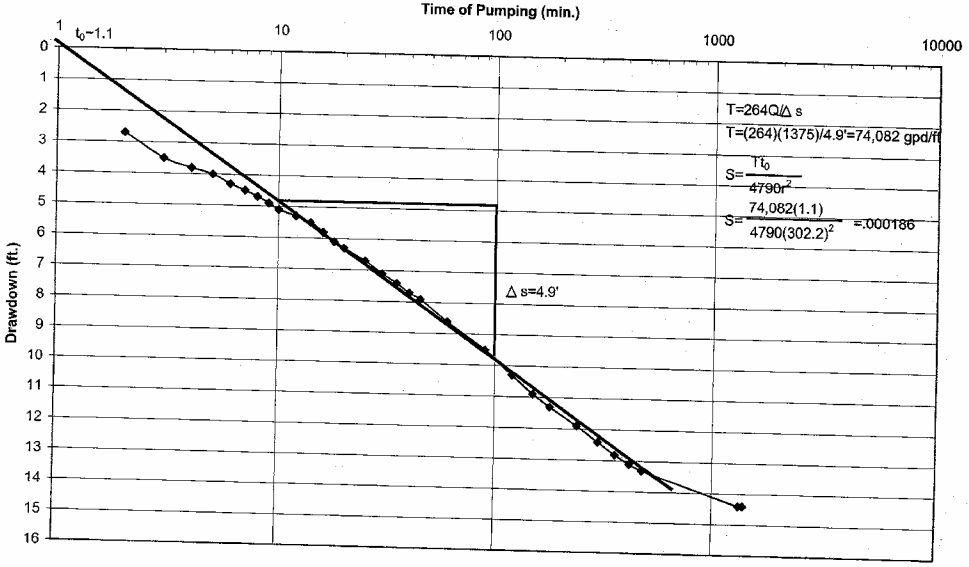


Fig. 4 - BASS LAKE PUMPING TEST (3/25 - 3/26/03)
UZAROWICZ OBS. WELL

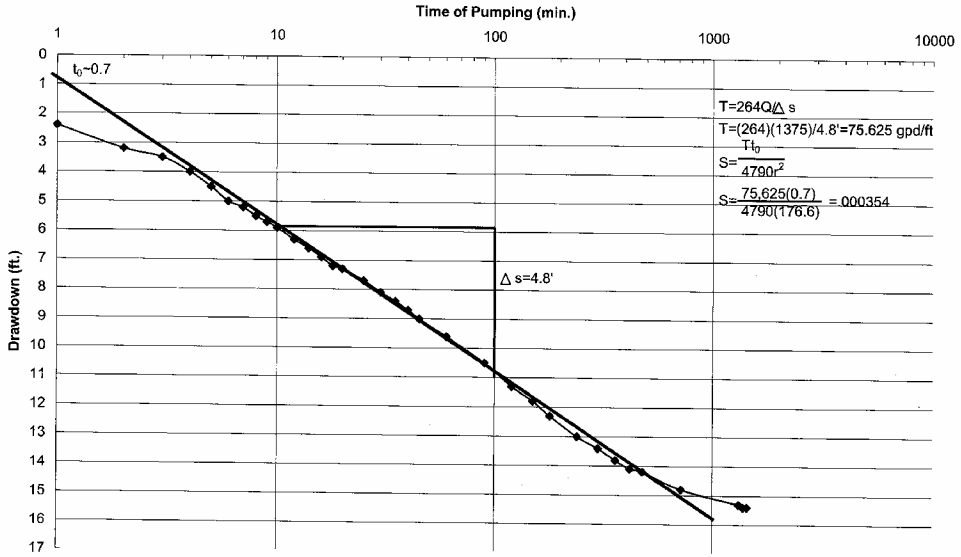


Fig. 5 - BASS LAKE PUMPING TEST (3/25 - 3/26/03)
PUMPING WELL

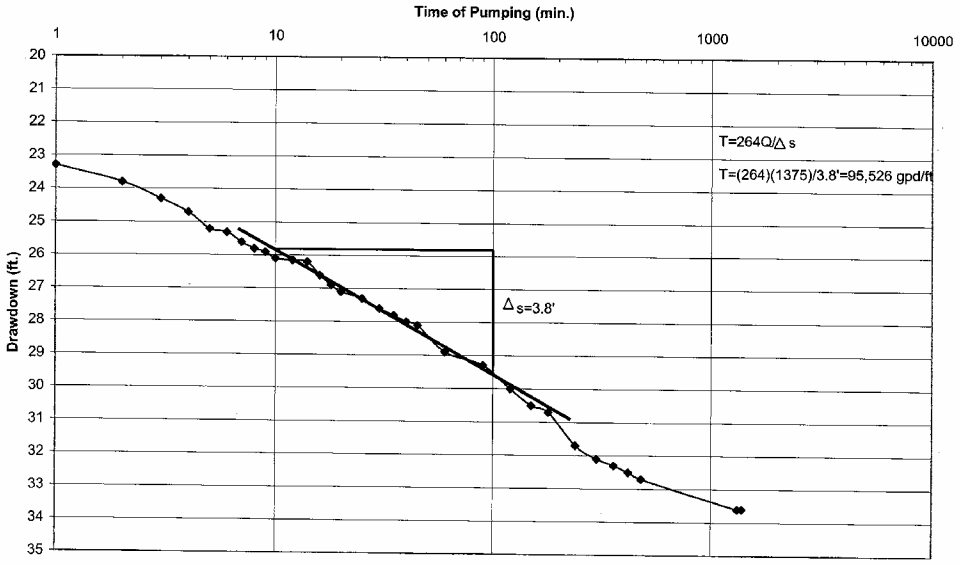


Fig. 6 - CAMBE OBS. WELL WATER LEVEL

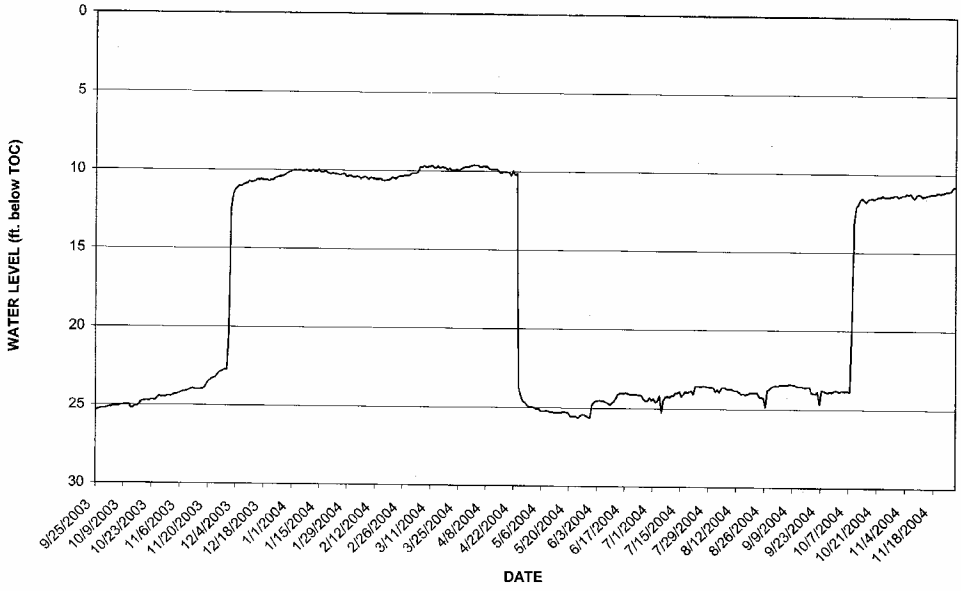
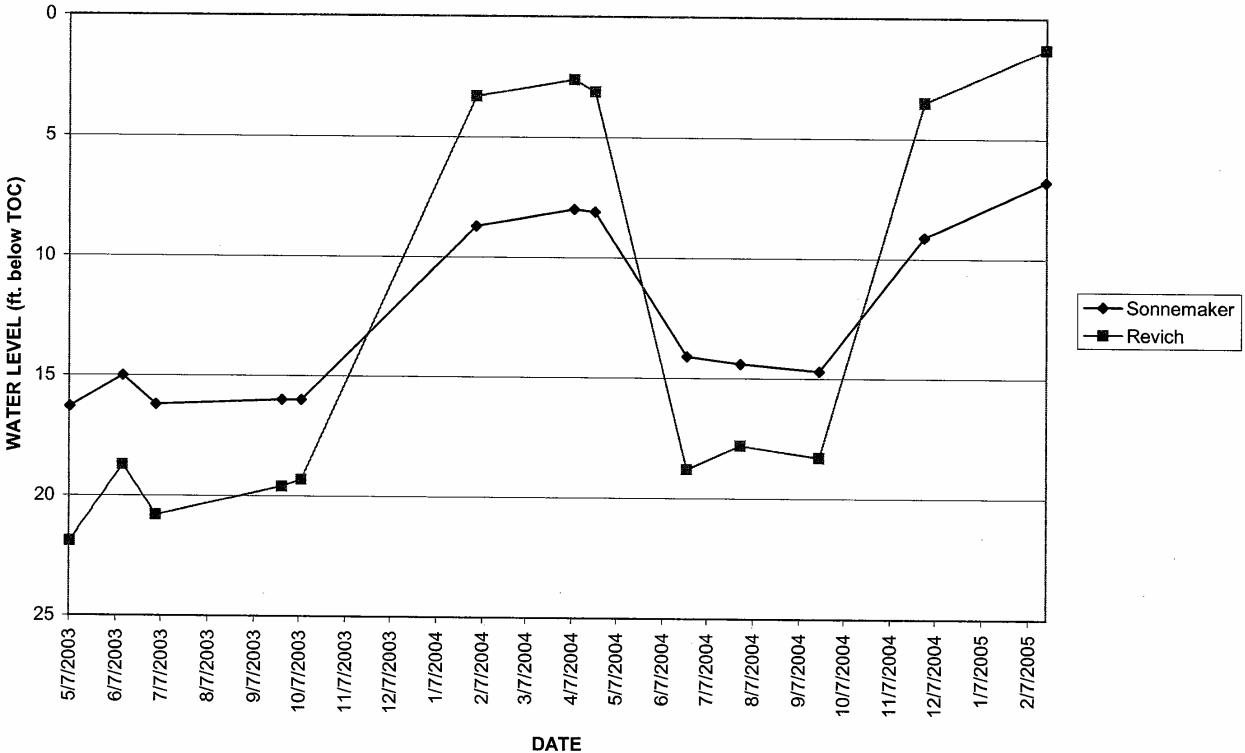


Fig. 7 - SONNEMAKER & REVICH OBS. WELLS WATER LEVELS



wells also provides no indication of a lowering trend of water levels. In general, data collected from monitoring wells in the area display a gradual recovery of water levels during the 2003 and 2004 pumping cycles of the recharge well. This water level recovery is likely due to the reduced pumping rate of the well and a response to precipitation events. The average discharge rate from the recharge well was documented to be about 1,300 gpm during the first 13 days of operation in 2004 (March 24 through May 7), but had reduced to an average rate of approximately 980 gpm for the last 18 days of pumping (September 20 through October 8). The 25% reduction in the pumping rate is believed to be due to the gradual decline of the pumping level within the well, and to some extent, a loss of pump efficiency during its operation.

Appendix C contains precipitation data collected by Bass Lake resident William Sonnemaker during May 7 through October 2, 2004. Nearly 21 inches of precipitation was recorded during this time period, and significant rainfall events correlate with ground water level fluctuations recorded in the Cambe observation well.

On April 20, 2004, a four-inch diameter, 100 foot-deep observation well was installed approximately 20 feet east of the Bass Lake recharge well. The well was completed in gravel that was present at a depth of 68 ft. to 105 ft. Division staff were on site at the time of the well installation, and recorded three clay layers at depths of 10ft. to 26 ft., 36 ft. to 37 ft. and 58 ft. to 68 ft. below land surface. A copy of the water well record is included as Appendix D. This observation well was also equipped with a In-Situ Mini-Troll pressure transducer that recorded both daily water levels and ground water temperatures. A plot of the daily water levels for April 22 through November 25, 2004, is available in Figure 8. Approximately 25 feet of water level decline occurred in the observation well during the 2004 pumping cycle. As previously documented in the Cambe well, this data shows a gradual recovery of the ground-water level during the latter portion of the recharge well's 2004 pumping cycle, as well as responses to significant precipitation events that occurred during the period of record.

Ground Water and Lake Temperature Correlation

Figure 9 is a thermograph of daily ground water temperatures, in degrees Fahrenheit (F), measured in the deep observation well during April 22 through November 25, 2004. Ground-water temperature was monitored in an attempt to document a hydrologic connection between Bass Lake and the recharge well, and to determine whether the well was primarily recirculating water between the lake and the deep aquifer. Excluding the anomalous temperature drop of 0.23 deg. F that occurred on October 8, water temperature in the observation well fluctuated between 54.12 and 53.44 deg. F during the period of record. The thermograph displays a gradual drop in ground-water temperature during the pumping cycle of the recharge well, and a corresponding increase in water temperature following shut down of the well on October 8. The reason for the significant drop in ground-water temperature on the day the pump was shut down is not known.

Fig. 8 - DEEP OBS. WELL WATER LEVEL

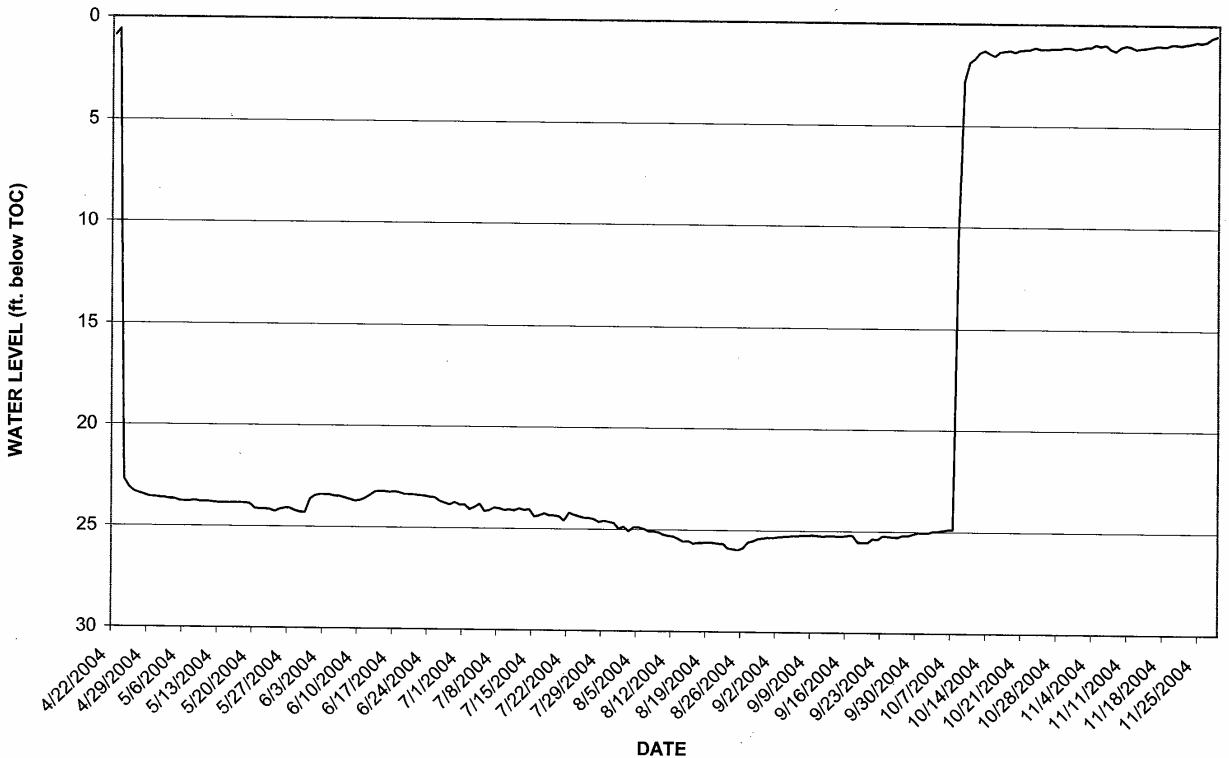
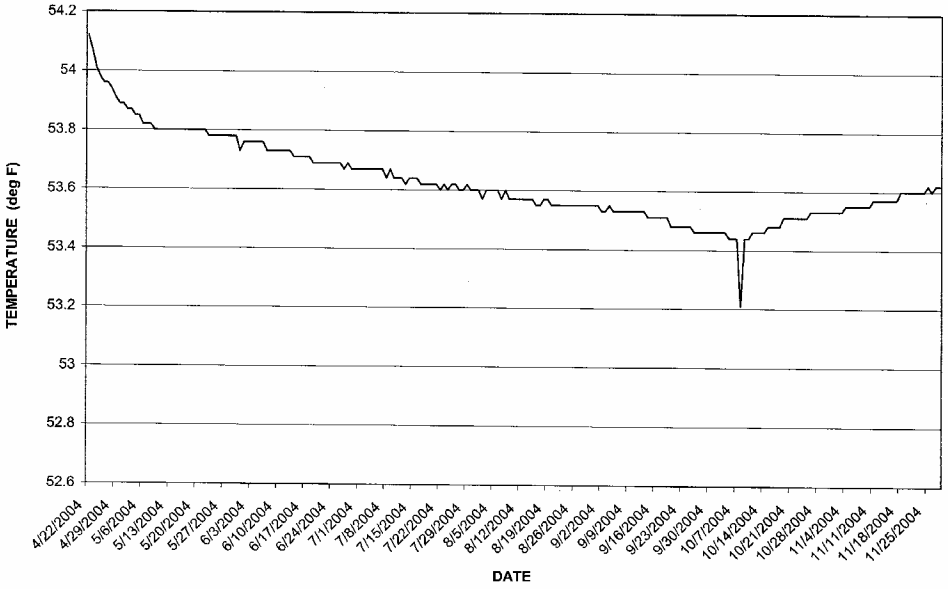


Fig. 9 - DEEP OBS. WELL WATER TEMPERTURE



Bass Lake water temperature was periodically measured at the William Sonnemaker residence during May 7 through September 23, 2004, (Appendix C) by the use of a thermometer suspended in the lake to a depth of approximately two feet. Lake temperatures ranged from 62 deg. F on May 7 to 80 deg. F during June and July. Although the data was collected at a fairly shallow depth, historic water temperature profiles presented in the Bass Lake Diagnostic Study indicate that the lake typically does not exhibit a stratified structure, or is very weakly stratified. Therefore, water temperature is expected to be fairly consistent throughout its depth. Figure 10 is a thermograph that compares temperatures of water in the deep observation well and in Bass Lake during May 7 through October 1, 2004. The data appear to show no correlation between water temperatures of the deep aquifer and the lake, and do not indicate a rise in the ground water temperature during the summer of 2004 that might be expected if the warmer lake water was significantly recharging the deep aquifer.

Aquifer and Lake Level Correlation

On May 7, 2004, Division of Water staff installed a 1¼ inch diameter "drive point" observation well adjacent to the deep observation well. Both wells are located approximately 20 feet east of the Bass Lake recharge well. This shallow observation well is about ten feet deep, and is equipped with a three foot long wire mesh screen. The well was installed to a depth consistent with the thickness of the surficial sand that was identified at the site during the installation of the deep observation well. This shallow well was installed in order to document the correlation between water levels in the shallow sand and in Bass Lake, as well as the potential impacts to water levels in the shallow sand caused by pumping of the recharge well. Ground water levels were periodically measured in the shallow well by Mr. William Sonnemaker from May 7 through October 2, 2004, and are available in Appendix C. Lake level elevations were also collected by Mr. Sonnemaker for this time period, and are available in Appendix 2. Lake levels were made with the use of a staff gage installed on Mr. Sonnemaker's pier by the Division of Water. The gage provides only "relative" differences in water levels, and was not tied to NGVD.

Data collected from the shallow observation well and the Bass Lake staff gage are shown in Figure 11. The data indicate a direct correlation between the water level in the shallow sand aquifer and the lake, and fluctuations that occur in both due to seasonal influences. Water levels measured in the shallow observation well do not seem to indicate the existence of a strong hydrologic connection between the surficial sand and the deep sand and gravel aquifer. Although a water level decline of approximately 25 feet occurred in the deep aquifer during the 2004 pumping cycle, a corresponding lowering of the water level in the shallow observation well was not observed. It appears that the clay units present at this location substantially limit the hydrologic connection between the shallow sand and the deep aquifer.

Fig. 10 - BASS LAKE AND DEEP OBS. WELL WATER TEMPERATURES

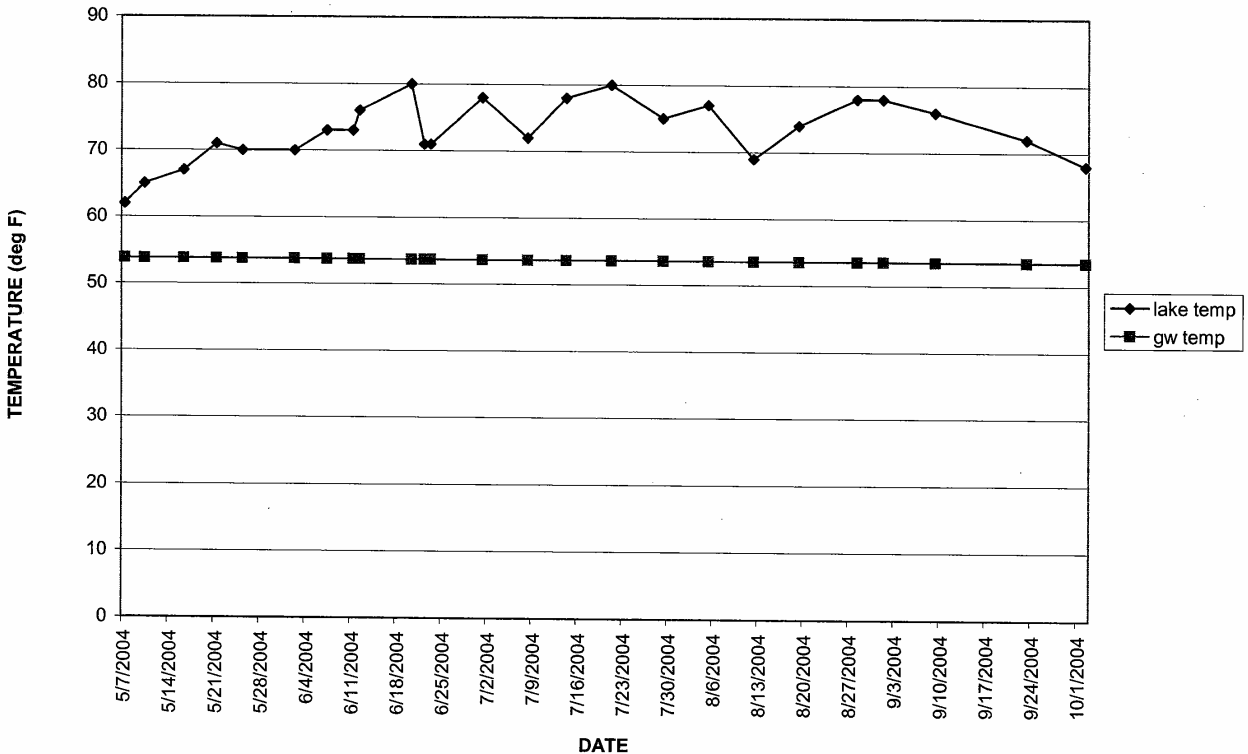
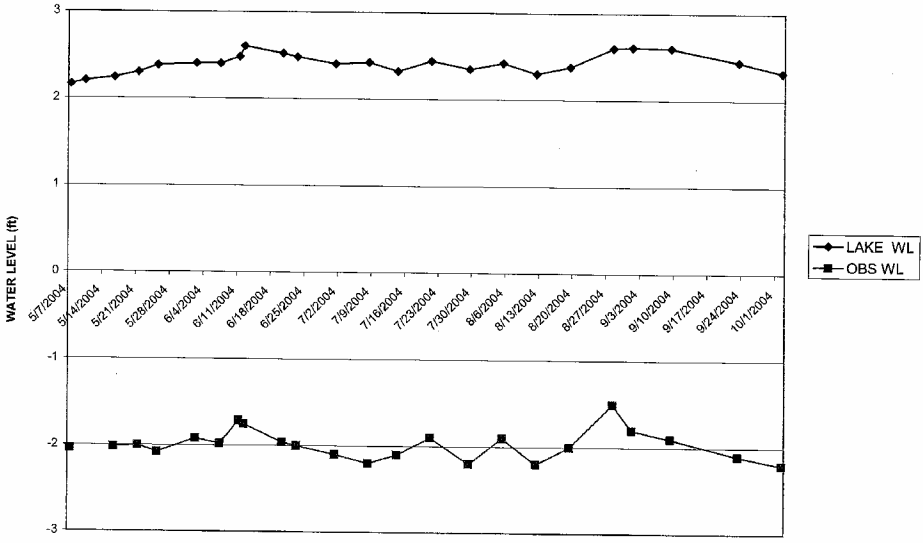


Fig. 11 - BASS LAKE & SHALLOW OBS. WELL WATER LEVELS



Summary and Conclusions

The Bass Lake Diagnostic Study identified low lake levels as one of the greatest concerns of Bass Lake residents. The effectiveness of the recharge well installed in 1964 to regulate lake levels has often been questioned due to the potential hydrologic connection between the deep aquifer and the shallow aquifer. The diagnostic study recommended that a ground water monitoring network be installed in order to evaluate the existence and extent of the connection between the two aquifers. In response to this recommendation, the Division of Water, with the assistance of the Division of Soil Conservation and the Bass Lake Property Owner's Association, conducted a hydrogeologic evaluation of the Bass Lake recharge well during the years 2003 and 2004. The results of this evaluation are as follows:

1). The Bass Lake recharge well is equipped with a single stage turbine pump having a setting of 67 feet and a pumping capacity of approximately 1400 gpm. Total pumping from the well for 2003 and 2004 was reported to be 381.999 MG and 258.465 MG, respectively.

2) A 24-hour pumping test was conducted on the recharge well on March 25 through 26, 2003. An average Transmissivity (T) value of 79,829 gal/day/ft. and a Storage Coefficient (S) of 0.00022 were calculated from the data, indicating a confined aquifer with fairly good water supply capability.

3) Ground water level monitoring was conducted in the vicinity of the recharge well during May 7, 2003, through February 18, 2005. Six domestic wells, two observation wells and the pumping well were measured during the time period. Two of the wells (Cambe and the deep observation well) were equipped with pressure transducers that recorded daily water levels. Data collected from the wells show no obvious lowering trend that would indicate that water withdrawals were exceeding the recharge capability of the aquifer.

4) A gradual recovery of water levels was documented in the observation wells during the 2003 and 2004 pumping cycles of the recharge well. The recovery is believed to be due to a reduction in the pumping rate of the recharge well (25% during the 2004 pumping cycle), some loss of pump efficiency, and a response to precipitation events.

5) A gradual reduction of ground water temperatures occurred in the deep observation well during the 2004 pumping cycle of the recharge well, and temperatures increased after pumping ceased. Temperature trends in the deep aquifer do not correlate with those measured in Bass Lake.

6) A direct correlation exists between ground water levels in the shallow sand aquifer and Bass Lake. However, no direct hydrologic connection between the shallow and deep aquifers was documented at the site of the recharge well during the 2004 pumping cycle.

The hydrogeologic evaluation of the Bass Lake Recharge Well does not seem to indicate a rapid and/or direct hydrologic connection between the deep sand and gravel aquifer and Bass Lake. Clay layers identified in the vicinity of the well appear to substantially limit any induced recharge from the lake to the deep aquifer during a pumping cycle. However, these clay deposits are not believed to be continuous throughout the area, and their presence should be validated at locations where additional recharge wells may be proposed.

APPENDIX A

DIVISION OF WATER RESOURCES
INDIANA DEPARTMENT OF CONSERVATION
311 WEST WASHINGTON STREET
INDIANAPOLIS, INDIANA

JAN 1965
RECEIVED
Dept. of Conservation
Division of
Water Resources

WATER WELL RECORD

INFORMATION ON WELL LOCATION

County in which well was drilled: STARKE Civil Township: 32 N

Congressional township: _____ Range: 1W Number of section: ~~#87~~

(Fill in as completely as possible)

Describe in your own words the well location with respect to nearby towns, roads, streets or distinctive landmarks: CENTER OF FIRE LANE ON BEACH JUNCTION HWY 210 & HWY 10.

Name of owner: BASS LAKE PROP. OWNERS ASSN. Address: BASS LAKE, IND.

Name of Well Drilling Contractor: JP MILLER ARTESIAN WELL CO.

Address: Box 35-9 BROOKFIELD, ILL.

Name of Drilling Equipment Operator: JOHN KILCOYNE

INFORMATION ON THE WELL

Completed depth of well: 110 ft. Date well was completed: 11-13-64

Diameter of outside ~~casing or liner pipe~~ HOLE: 36" Length: 110'

Diameter of inside casing or liner: 16" Length: 80'

Diameter of Screen: 12" Length: 28' Slot size: 1/8"

Type of Well: Drilled ☐ Gravel Pack ☒ Driven ☐ Other _____

Use of Well: For home ☐ For ~~RECHARGE~~ LAKE ☒ For public supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☒ Jet ☐ Driven ☐

Static water level in completed well (Distance from ground to water level) 3 ft.

Bailer Test: Hours tested _____ Rate _____ g.p.m. Drawdown _____ ft. (Difference between static level and water level at end of test)

Pumping Test: Hours tested 9 Rate 1500 g.p.m. Drawdown 29 ft.

Signature Elmer Anderson

Date 1-6-65

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

APPENDIX B

GROUND-WATER LEVELS *
BASS LAKE
STARKE CO., INDIANA

DATE:	5/7/03	6/11	7/3	9/25	10/8	2/2/04	4/8	4/22
1. CAMBE	27.4	24.5	26.5	25.3	25.1	10.3	9.8	10.3
2. PIZUR	31.4	28.4	30.5	29.3	------	13.3	12.8	13.3
3. UZOROWICZ	21.9	18.7	20.9	19.6	19.3	3.0	2.3	2.8
4. PUMPING WELL	42.1	------	45.2	50.6	------	2.2	1.4	2.0
5. SONNEMAKER	16.3	15.0	16.2	16.0	16.0	8.7	8.0	8.1
6. REVICH	21.9	18.7	20.8	19.6	19.3	3.3	2.6	3.1
7. SWANSON	11.8	9.9	11.4	10.8	10.6	------	------	------
8. 1 ¼ INCH OBS WELL	------	------	------	------	------	------	------	------
9. 4 INCH OBS WELL	------	------	------	------	------	------	------	------
10.								

* All measurements in feet below top of casing

GROUND-WATER LEVELS *
BASS LAKE
STARKE CO., INDIANA

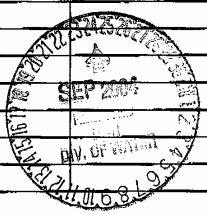
DATE:	5/7/04	6/23	7/29	9/20	11/29	2/18/05		
1. CAMBE	25.3	24.3	23.5	24.0	10.7	8.4		
2. PIZUR	------	28.3	27.3	------	13.7	11.6		
3. UZOROWICZ	19.9	18.8	17.8	18.3	3.3	1.0		
4. PUMPING WELL	43.1	46.1	51.3	51.0	2.5	flowing		
5. SONNEMAKER	------	14.1	14.5	14.7	9.1	6.8		
6. REVICH	------	18.8	17.8	18.3	3.5	1.3		
7. SWANSON	------	9.0	8.8	9.0	------	------		
8. 1 ¼ INCH OBS WELL	2.1	2.0	2.2	2.1	1.8	0.9		
9. 4 INCH OBS WELL	24.6	24.4	25.4	26.4	1.4	flowing		
10.								

* All measurements in feet below top of casing

APPENDIX C

BASS LAKE DIAGNOSTIC STUDY
Starke County, Indiana

DATE	LAKE LEVEL (staff gage - ft.)	LAKE TEMP. (deg. F)	OBS. WELL WL (ft. below TOC)	COMMENTS (PRECIP/ETC.)
5/7/04	2.16'	62°	2' 1/2"	.75" in AM
5-10-04	2.20'	65°		
5-16-04	2.24'	67°	2' 1/4"	1 1/4" RAIN 5-15/5-16
5-21-04	2.3'	71°	2'	3/4" RAIN 5-20
5-25-04	2.28	70°	2' 1"	1/4" RAIN 5-24
6-2-04	2.40	76°	1' [illegible]	3+ INS. RAIN 5-30
6-7-04	2.40	73°	1' 11 3/4"	
6-11-04	2.48	73°	1' 8 1/2"	1 1/2" RAIN 6-10
6-12-04	2.60	76°	1' 9"	1 1/2" RAIN 6-11
6-20-04	2.52	80°	1' 11"	
6-23-04	2.48	71°	2'	
7-1-04	2.40	78°	2' 1 1/2"	
7-8-04	2.42	72°	2' 2"	2" RAIN 7-5
7-14-04	2.32	78°	2' 1"	1/4" RAIN 7-13
7-21-04	2.44	80°	1' 11"	2 1/2" RAIN 7-20
7-29-04	2.35	75°	2' 2"	
8-5-04	2.42	77°	1' 11"	2" RAIN 7-30-04
8-12-04	2.30	69°	2' 2"	
8-19-04	2.38	74°	2'	2" RAIN 8-17 & 18
8-28-04	2.60	78°	1' 5 1/2"	3" RAIN 8-24 TO 8-27
9-1-04	2.61	78°	1' 10"	
9-9-04	2.60	76°	1' 11"	
9-23-04	2.44	72°	2' 1 1/4"	
10-2-04	2.32	68°	2' 2 1/4"	



APPENDIX D

RECORD OF WATER WELL

State Form 35680 (R4 / 4-92)

Mail complete record within 30 days to:
INDIANA DEPARTMENT OF NATURAL RESOURCES
Division of Water
402 W.Washington St., Rm. W264
Indianapolis, IN 46204
(317) 232-4160

Fill in completely

WELL LOCATION

County where drilled	Civil township	Township	Range	Section
Starke	North Bend	32N	1W	7

Driving directions to the well location (*include county road names, number, subdivision lot number with consideration to intersecting road and trip origination*). There is space for a map on reverse side.
from CR 210 & 10 go West approx 1/4 mile down access lane

OWNER-CONTRACTOR

Name of well owner: Bass Lake Property owners assoc
Telephone number: 574.772.2452

Address (*number and street, city, state, ZIP code*): Bass Lake IN

Name of building contractor:
Telephone number:

Address (*number and street, city, state, ZIP code*):

Name of drilling contractor: DAVIS AND SONS WELL DRILLING
Telephone number:

Address (*number and street, city, state, ZIP code*): [illegible] West [illegible] South, North Judson IN [illegible], 574 [illegible]

Name of equipment operator: Dwayne Davis
License number: 1667
Date of completion: 5-04

CONSTRUCTION DETAILS

Use of well: ☐ Home ☐ Public supply ☐ Industry ☐ Stock ☒ Test ☐ Other (*specify*): ☐ Irrigation

Method of drilling: ☒ Rotary ☐ Cable tool ☐ Jet ☐ Rev. rotary ☐ Bucket rig ☐ Other

Casing length	Material	Diameter
95 feet	PVC	4 inches

Screen length	Material	Diameter
5 feet	PVC	3 inches

Screen slot size: .020
Total depth of well: 100

Depth of pump setting: No
Water quality (clear, cloudy, odor, etc.): clear (circled)

Type of pump: ☐ Submersible ☐ Shallow-well jet ☐ Deep-well jet ☐ Other (*specify*):

WELL LOG

FORMATIONS: Type of material	From (*feet*)	To (*feet*)
medium yellow sand	0	12
clay	12	16
Coarse sand	16	32
medium sand	32	70
Coarse large sand & gravel	70	88
large gravel	88	100

(Additional spac[e]

IDNR Well Log	From	To
Sand	0	10
Clay	10	26
Sand and Gravel	26	36
Clay	36	37
Fine Sand	37	55
Coarse Sand	55	58
Clay	58	68
Sand and Gravel	68	105

WELL CAPACITY TEST

Check one: ☐ Bailing ☒ Air ☐ Pumping

Test rate: 100 gpm 1 hrs.

Drawdown: feet

Static level (*depth of water*): 3 feet

GROUTING INFORMATION

Grout material	Depth of grout
Benseal	From 0 to 70

Method of installation	Number of bags used
Tremie	5

WELL ABANDONMENT

Sealing material / Depth of fill From To / Method of installation / Number of bags used

I hereby swear or affirm, under the penalties for perjury that the information submitted herewith is to the best of my knowledge and belief, true, accurate and complete.

Signature of owner or authorized representative: Dwayne Davis
Date: 5/04